

# NASA EARTH SCIENCES SENIOR REVIEW 2005

## Evaluation of Education and Public Outreach

### INTRODUCTION

The Education and Public Outreach (E/PO) Panel met April 13 through April 14, 2005 to review the E/PO component of proposals for extended missions for ACRIMSAT, ERBE, GPS, GRACE, ICESat, Jason, QuikSCAT, SAGE, Terra, TOMS, TRMM, and UARS. The request for E/PO plans was in response to the following language in the call:

*Most of the Earth Science flight missions have implemented education and public outreach (E/PO) activities to varying degrees. The Science Mission Directorate is committed to continuing support for education and public outreach. First, summarize what has been accomplished in previous years. Second, describe your plans for the period covered by this proposal. Characterize your planned activities against the evaluation criteria for E/PO programs within the Science Mission Directorate. An expenditure of 1-2% of the total budget request (or \$15,000 per year, whichever is higher) is considered reasonable; however, variation from this guideline is allowed and must be justified.*

The criteria used to in the review process were those used to evaluate all NASA E/PO activities:

- Intrinsic Merit
  - Quality and Feasibility
  - Customer Focus
  - Partnership/Leverage/Sustainability
  - Evaluation
- Relevance to NASA's Education Objectives
  - Content
  - Pipeline
  - Diversity
- Cost/Resource Utilization

For full explanation of these criteria and performance indicators, please see:  
<http://science.hq.nasa.gov/research/guidelines.html#evaluation>.

### REVIEW PROCESS

The panel, chaired by Paula Coble at NASA HQ, was composed of science, education and outreach specialists from universities and research organizations. Proposals were independently

reviewed by three panelists, who submitted written reviews prior to panel meeting. Each proposal was presented by the primary panelist, followed by comments from the secondary panelists and further discussion by the full panel. Scores determined by the three panelists, with input and consultation with the rest of the panel. Consensus review written up by the primary panelist, read and approved by the secondary panelists before being finalized. Proposals were scored on a scale of 1 (Poor) to 5 (Excellent). Final scores for proposals considered by the panel ranged from 1.5 to 4.0, with no proposal rating “Excellent” overall. Proposals were not ranked overall, as there was no expectation that funding decisions for extended missions would be influenced by the quality of the E/PO component. Rather, the primary intent of the scores was to convey an adjectival rating for proposal areas as well as for the overall E/PO plan.

## COMMON ISSUES

This E/PO review represents the first attempt to review the E/PO activities embedded in the operating missions in the Earth Science. The array of products and activities that have resulted from mission E/PO efforts is truly impressive, and mission E/PO has undoubtedly had a positive effect on the public.

The panel noted a wide diversity in the scope of activities, size of project budgets, and relative proportion of education vs. outreach activities in each proposal. Most E/PO activities over the last few years were formulated prior to implementation of new evaluation criteria, and while most proposals addressed the new criteria in their future plans, a few seemed not cognizant of the existence of the criteria. While the panel recognizes the difficulty in meeting all criteria on limited budgets (\$15,000), project size was not correlated with responsiveness to evaluation criteria. Mission E/PO represents a significant portion of NASA’s education portfolio, and outcomes need to advance the education goals of the agency. In the future, it is the hope of the panel that E/PO personnel will be more cognizant of and responsive to the evaluation criteria that are in effect.

## **Project Name: ACRIMSAT**

### **Past performance**

Baseline effort including website, lectures, graduate student support, and bookmarks. More outreach than education.

### **Proposal**

#### **Strengths:**

1. The panel was pleased to see that this proposal reflected responsiveness to new education and outreach criteria, moving away from traditional mission publicity activities as the only E/PO efforts.
2. Good use of partnerships with existing NASA programs. The ACRIMSAT team will connect with other E/PO specialists at NASA and effectively incorporate their new content into ongoing formal and informal education efforts (Solar System Ambassadors, NASA Explorer Schools, and Sun-Earth Connection Forum).
3. Expectation for significant educational benefit from small expenditure of funds.

#### **Recommendations:**

1. The panel was very excited about the science results of this mission, but felt that the E/PO effort did a poor job of communicating what was unique about the mission to the public. The E/PO staff should work more closely with the mission scientists to determine the one or two key science messages they would like the public to learn about the mission.
2. An evaluation plan is essential, to determine if key messages are being communicated to audience. Formative evaluation of activities is also needed to insure effectiveness and continued improvement.

## **Project Name: ERBE**

### **Past performance**

No past effort reported.

### **Proposal**

#### **Strengths:**

1. Good use of existing NASA programs as partners. Propose to team with REASoN education project (MY NASA DATA) and Earth Observatory.

#### **Recommendations:**

1. With such a small budget, the panel recommends dropping the plan to develop new lesson plans, and focus on providing data microsets to MY NASA DATA and information for stories to Earth Observatory.

## **Project Name: GPS**

### **Past performance**

Baseline effort including post-doc support, and lectures. More outreach than education.

### **Proposal**

While the list of proposed activities is long, most of them do not seem to amount to much more than the normal community service expected of a government institution. Goals are creating GALS awareness and increasing the NASA Vision awareness.

### Strengths:

1. The panel was very excited about the unanticipated science results from what would seem to be an operational mission, and thought these results would be of interest to the general public - an example of the reality of the serendipitous nature of the origins of many science successes.

### Recommendations:

1. The proposal notes that GALS science is difficult for the public at large to understand, although the familiarity with GPS certainly provides a starting point. Perhaps the more GPS-aware public (surveyors, planners, boat owners) might be a community to target, starting from the concept of alternate uses of an established system intended for a very different purpose. Climate is a very interesting topic for the public, and GPS is one of the few technologies that schools are likely to have. No user would ever look at their GPS unit the same way again if they knew it was a climate research tool as well as a global position sensor.
2. Project staff should seek partnerships with successful NASA E/PO teams to leverage distribution of unique mission science content. Solar System Ambassadors is listed, and a very good way to begin to refine how to tell the “story” of GALS and GPS to the public. NASA Explorer Institutes and partnerships with Girl Scouts and National Park Service could make additional interested audiences.

## **Project Name: GRACE**

### **Past performance**

Past activities include a mixture of education and outreach, including electronic resources, lectures and press conferences, outreach products, and classroom activities. This was one of the only missions to list a formal collaboration with an educational publishing company (BSCS) for distribution of the materials. Unfortunately, many of the materials do not credit NASA for sponsorship.

### **Proposal**

#### Strengths:

1. The GRACE E/PO plan is an extensive, well-considered effort for a number of audiences. The plan meets most of the NASA E/PO evaluation criteria, with evidence of wide dissemination, strong partnerships, and evaluation.
2. The monthly telecons among partners also was an excellent strategy, not evident in other proposals.

#### Recommendations:

1. The reviewers thought the GRACE science was very exciting, but that the uniqueness of the science results of the mission and of the “as only NASA can” elements were not well exploited. The panel strongly recommends that GRACE E/PO team work closely with the scientific team to generate one or two clear messages about their mission’s findings and communicate these messages to the public. These messages go far beyond the goal stated in the proposal of “to improve our understanding of the Earth’s dynamical system.”
2. The exciting new discoveries also need to be taken to school audiences. The concept of how GRACE works as well as telling how and why Earth’s gravity changes are important new content for formal education, and are fundamental to the National Science Standards. The fact that students have a least an intuitive understanding of gravity makes a real-life starting point for this learning.
3. Additional lesson plans are of value only to the extent that they include the new science content and unique NASA contributions of GRACE for the study of gravity, hydrology, etc. Otherwise, better value would be derived from diversifying products and activities.
4. Evaluation of effectiveness of activities and communication of key message is essential.

## **Project Name: ICESat**

### **Past performance**

Past E/PO efforts consist of mostly traditional activities – press conferences, science lectures, student support and mentoring, developing visualizations, and distributing brochures, graphics and other outreach materials.

### **Proposal**

Propose to continue past activities. PI appears to have little or no awareness of E/PO evaluation criteria in effect for proposal review.

### Strengths:

1. Mission results have gotten a lot of very good press coverage, including a feature article in NY Times.
2. Ice and polar regions have always been of high interest to the public. With recent major ice melting events, the public interest is perhaps at an all time high. Much opportunity exists to engage the public with ICESat results.

### Recommendations:

1. This plan was almost entirely “passive” E/PO, with the strategy of developing products and maintaining a web site with no consideration of audience or audience needs. Likewise, there seemed to be no awareness of the numerous effective E/PO efforts supported by NASA. The panel’s main recommendation was for those responsible for the E/PO plan to connect with the active E/PO teams at other NASA centers. The Terra E/PO team, with elements of cryosphere science, would be especially relevant. Leveraging of efforts in this way would prevent duplication of materials and amplify the impact of content that is unique to ICESat.
2. The panel also strongly recommends that resources devoted to the web site be significantly reduced, unless assessment data show that it has high impact on intended audience. If the major audience is scientists, then the activity should be funded from the research budget. Likewise, data processing is a research, not an E/PO activity.
3. The budget allocation of ~\$200K/year is significant when compared to that of other missions, so there is really no excuse for the E/PO plan to be described as “spartan.” It should make a significant contribution to NASA education and public outreach programs.

## **Project Name: Jason-1**

### **Past performance**

TOPEX/Poseidon, the precursor mission to Jason-1, reached millions of people through production and dissemination of education and outreach materials for various audiences. Jason-1 has a similarly successful record of producing products for diverse audiences, formal as well as informal.

### **Proposal**

#### **Strengths:**

1. Propose to continue successful hands-on science program initiated in France and establish a similar program in US schools. This type of project engages students in active learning, which is more effective pedagogically and also more effective in promoting STEM careers.
2. This is a well-balanced plan with adequate attention to diversity and evaluation criteria, both of which were lacking in most of the other proposals.

#### **Recommendations:**

1. The panel strongly recommends that all products be submitted to the ESS Product Review, including products currently in development as well as effective products developed in the past.
2. Most of the weaknesses noted in the panel consensus could be attributed to the page limits imposed by guidelines.



## **Project Name: QuikSCAT**

### **Past performance**

QuikSCAT has produced high quality materials and activities, aimed at reaching a broad and diverse audience, with proven successful impact. Past efforts have also been highly leveraged with other NASA E/PO partners.

### **Proposal**

#### **Strengths:**

1. The proposal contains innovative program ideas that leverage and build upon past successes and provide cost-effective initiatives.
2. The proposed activities reach a diverse range of target audiences from the general public to K-16 students.
3. The project design amply provides an understanding and commitment to achieving NASA E/PO goals and objectives.

#### **Recommendations:**

1. Most of the weaknesses noted in the panel consensus could be attributed to the page limits imposed by guidelines.
2. The E/PO team and mission scientists should develop a better sense of what to communicate that clearly conveys the unique contribution that NASA/QuikSCAT brings to education and its relevance to the public.

## **Project Name: SAGE**

### **Past performance**

Past efforts have focused on secondary students and teachers with development and distribution of hands-on kits for students to use, a website to provide supporting educational materials, professional development workshops for teachers, and a student essay contest. Post-secondary education and workforce development efforts have included minority students. Outreach activities included development of press kits.

### **Proposal**

#### Strengths:

1. This was a very responsive proposal and clearly aligns with several NASA Education Enterprise goals (including increasing elementary and secondary participation, enhancing higher education STEM capability, and expanding underrepresented/underserved participation).

#### Recommendations:

1. The panel did not see a strong connection between the mission results and atmospheres on other planets, mentioned in the proposal as part of intended educational content. It was unclear the extent to which appropriate expertise resided in the science team, despite the obvious potential interest of audiences.
2. The panel strongly recommends significant involvement of the science team in developing and overseeing delivery of a clear message on significant, unique results of the mission.

## **Project Name: Terra**

### **Past performance**

Combined efforts of the individual instrument teams have produced high quality materials and activities, aimed at reaching a broad and diverse audience, with proven successful impact. Most notable are Earth Observatory, S'COOL, and MODIS Rapid Response web site, which also reaches operational users. These activities, as well as healthy interest by the press and ease of understanding imagery, have made Terra products known to millions of people around the world.

### **Proposal**

#### **Strengths:**

1. The integrated approach presented in the optimal budget scenario is a model of how a meaningful E/PO program should be designed: a coordinated, well-integrated effort among the instrument teams.
2. Several existing components or partnerships represent some of the most effective E/PO elements in the NASA Earth Science program, including Earth Observatory.

#### **Recommendations:**

1. The panel felt that the integrated E/PO plan presented in the optimal budget option was the part that should be implemented. However, it was unclear to what extent the “added” activities relied on the “baseline” activities. The panel also did not understand why the team chose not to structure the entire proposal around a coordinated, inter-team effort.
2. The baseline plan should be drastically revised along to integrate all activities across instrument teams. The public really doesn't care which mission does what. The message of interest to the public is - what are the cool results? There is no better example of integrated Earth System Science than combined results of Terra, and this should be a top priority for all the mission teams. Revised plan should eliminate activities of lower value and impact, eliminate duplication of efforts among instrument teams, and focus on the activities and products shown to have the greatest effectiveness at reaching the target audience with the science results of significance.
3. Formal evaluation and a dedicated E/PO coordinator should be essential elements of any revised E/PO plan.

## **Project Name: TOMS**

### **Past performance**

TOMS E/PO has made a significant contribution to public understanding of ozone in the Earth's atmosphere. Formal education efforts have been well-leveraged with those of other NASA missions.

### **Proposal**

#### Strengths:

1. Proposed TOMS E/PO will build on and leverage existing resources and programs. For a relatively small budget, they should be able to accomplish some very good things.
2. The “ozone hole” is a topic that is of interest to the public – Website has great potential.
3. Proposed project puts real science in the hands of students. Sun photometers will be provided to each participating NASA Explorer School, enabling students to collect data and conduct science investigations. The Explorer School program is designed to target underserved students.

#### Recommendations:

1. Activities in this effort need to be evaluated outside the scope of the programs of the partners. Formative evaluation is essential to give feedback to mission staff involved in workshops and other interactive activities, as well as for refining materials and methods of communication.

## **Project Name: TRMM**

### **Past performance**

This mission has taken an active role in communicating crucial mission results to media for improved understanding and prediction of severe storms. Perhaps more than any other, this strong focus on outreach has been appropriate. In addition, significant efforts have been made to produce materials for formal education audiences and make visualizations available in a variety of venues.

### **Proposal**

#### **Strengths:**

1. E/PO plans consist of continuing the use of media campaigns, popular magazines, DVD, website, etc to disseminate TRMM highlights and findings, and maintaining undergraduate involvement in mission support.
2. The subject matter continues to be of high interest and relevance to the public.

#### **Recommendations:**

1. Although the media interaction will likely continue to require major effort, especially during busy severe storm periods, the panel strongly recommends that the E/PO efforts attempt to achieve better balance among activities for formal education, informal science education, and public outreach.
2. The E/PO team should explore partnering with other NASA E/PO programs, including those conducted at their center, to leverage unique TRMM content to a larger audience.
3. An evaluation plan should be added and more attention given to increasing involvement of underserved and/or underrepresented populations.

## **Project Name: UARS**

### **Past performance**

A brochure for advanced students and a video were produced and distributed.

### **Proposal**

#### **Strengths:**

1. The proposal for E/PO directly addresses the pipeline issue by providing support to nine students at the Space Operations Institute at Capitol College.

#### **Recommendations:**

1. The panel strongly recommended that UARS should produce a new plan for E/PO that is more balanced and that truly communicates the findings of its mission to the general public and to school audiences.
2. Cost per undergraduate student of \$30K was not seen as an effective use of resources. This is a modest size mission, and many of the others are contributing significantly with far less resources.